

2019 Climate Review for Puerto Rico and the U.S. Virgin Islands.

Synopsis: Overall below normal rainfall was observed across Puerto Rico and the U.S. Virgin Islands during 2019, with the exception of the northwestern quadrant of Puerto Rico and a small section of the northeast. The summer months were particularly dry, and it caused the U.S. Drought Monitor to consider parts of Puerto Rico and a few of the U.S. Virgin Islands as having a “Severe Drought” (D2) for several months of the year. Our local area was affected by Hurricane Dorian, which affected mainly the U.S. Virgin Islands, and Tropical Storm Karen affected Puerto Rico. Above normal mean temperatures were observed at the main climate sites.

Summary: The typical and seasonable weather patterns were dominant this year, with the exception of the fact that eastern and central Puerto Rico as well as the U.S. Virgin Islands observed less rainfall than normal, while western and northwestern Puerto Rico observed higher than normal rainfall. With the exception of the impact from Hurricane Dorian across the northern U.S. Virgin Islands and Tropical Storm Karen over Puerto Rico, there were no other features or events that were out of what is considered normal, which includes occasional strong tropical waves or isolated flooding events. However, the main story of 2019 was the rainfall deficit, which gradually became more pronounced as the year progressed into the summer months, especially across eastern to central interior of Puerto Rico as well as the South Coastal Plains. Portions of the U.S. Virgin Islands also had rainfall deficits, especially Saint Croix who observed its longest period without measurable rainfall on record, which dates back to the year 1951.

During January and February, the weather pattern was fairly typical, but with lower than normal rainfall. The months of March and April were also drier than normal, but March had higher than normal rainfall across western Puerto Rico. April observed below normal rainfall across the local islands, but the extreme eastern sections of Puerto Rico observed higher than normal rain, most of this rain was due to a single rainfall event at the end of the month, which also caused flash flooding across the area, otherwise most of the month was generally dry. In May, the upper troughs over the local area were not as prevalent as usual with less moisture, which caused the month of May to be drier than normal across most of Puerto Rico and the northern U.S. Virgin Islands, except for northwestern Puerto Rico and Saint Croix. June and July observed many episodes of Saharan dust, limiting the shower and thunderstorm activity across the local islands, with all of the main climate sites (San Juan, Saint Thomas, and Saint Croix international airports) observing below normal rainfall. Because of this continued deficit in rainfall across central, eastern, and southern Puerto Rico, by early July the drought monitor had started categorizing some areas in Puerto Rico as having a “Severe Drought” (D2) (Fig 1). Saint Thomas and Saint Croix were also being categorized as having a Severe Drought by this point, while Saint John had “Abnormally Dry” (D0) conditions. However, the northwestern quadrant of Puerto Rico observed much higher than normal rainfall in June.

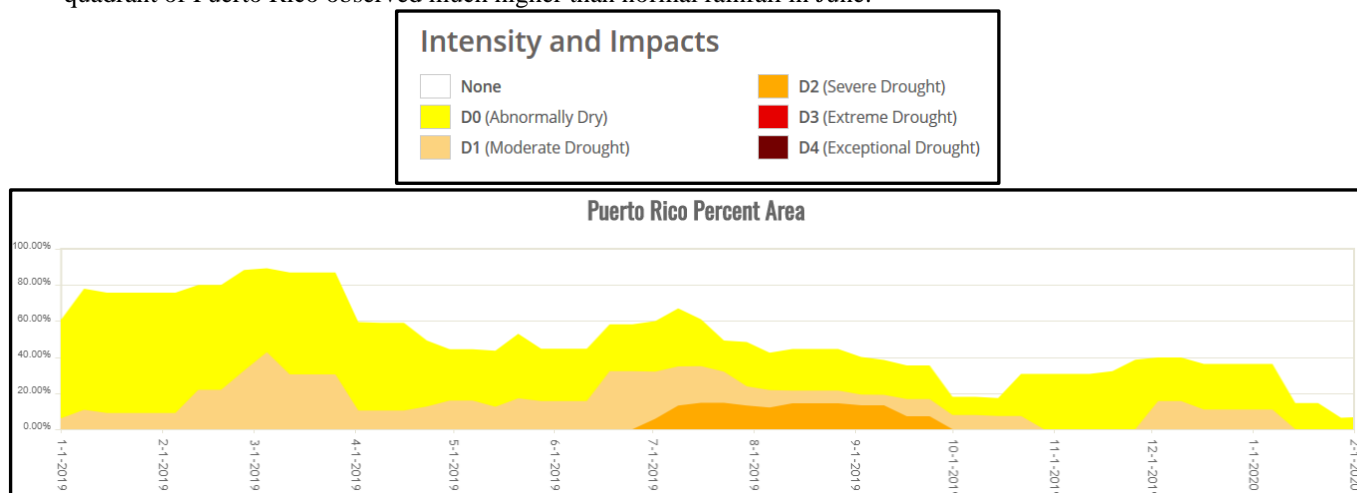


Figure 1. Percent Area of PR under U.S. Drought Monitor - Drought Categories 2019.

July had a dry start, seemed to be a continuation of June, but by the middle of the month several rainfall events caused significant rainfall across most of Puerto Rico and the U.S. Virgin Islands. In July, several rainfall daily records were broken at the main climate sites, while it was the wettest July on record for Saint Thomas with 7.75 inches. The drought conditions improved slightly after the month of July across some areas of Puerto Rico, while Saint Thomas and Saint Croix improved from a D2 to a Moderate Drought (D1). That said, Saint John did not observe as much rainfall and the drought conditions went from D0 to D1. The month of August was relatively dry, returning to the pattern of below normal rainfall across most areas in Puerto Rico except the northwestern quadrant. The U.S. Virgin Islands, did observe higher than normal rainfall, which helped the drought conditions, completely removing any drought classification from Saint Thomas and Saint John, but Saint Croix remained with the D1 classification. That said, the higher than normal rainfall over Saint Thomas and Saint John were mostly due to Hurricane Dorian affecting the islands towards the end of the month, causing around 3 to 5 inches of rain overnight from August 28th to August 29th.

During the early fall months, normally fairly rainy, we observed the typical increase in available moisture, and tropical waves, all of which enhanced rainfall and thunderstorm development over Puerto Rico in September, however, the U.S. Virgin Islands observed below normal rainfall in September. The rainfall total over Puerto Rico was also higher than normal due to Tropical Storm Karen, which affected Puerto Rico on September 24th and 25th, causing 2-5 inches of rain across many areas, particularly the south central, central interior and north central portions of Puerto Rico. After tropical Storm Karen affected Puerto Rico, the drought conditions improved significantly, maintaining the D0 classification in many areas, but no longer having areas under D1 or D2.

October was another month with much higher than normal rainfall across western Puerto Rico, and less than normal rainfall across eastern Puerto Rico. Unfortunately, the U.S. Virgin Islands also observed below normal rainfall, in fact all 3 main climate sites observed below normal rainfall. November was not much different; the normally rainy month of November left below normal rainfall across eastern Puerto Rico and the U.S. Virgin Islands. By the end of the month, the drought conditions had worsened once again to D1 across eastern Puerto Rico and Saint John, while Saint Thomas was classified as D0. However, like the previous month, November had higher than normal rainfall across western Puerto Rico. Some relief in the drought conditions started with December, where the southern half of Puerto Rico and Saint Thomas observed higher than normal rainfall. This rainfall caused an improvement in drought conditions across the northern U.S. Virgin Islands and some improvement over southern and eastern Puerto Rico. Overall, it was a drier than normal year across the local area (Table 1), except for northwestern Puerto Rico; mainly due to the abundance of rainfall that occurred due to local effects and sea breeze convergence, which normally occurs over western and northwestern Puerto Rico under a prevailing easterly to southeasterly wind flow.

For rainfall accumulation and percent of normal per climate division visit:

<https://www.weather.gov/sju/climo/stats/2019.pdf>

For the driest and wettest years on record visit:

<http://www.weather.gov/media/sju/climo/stats/TopYears.pdf>

As far as temperatures go, the local region ended the year with mean temperatures warmer than the 30-year average from the National Centers for Environmental Information (NCEI). This pattern of above normal temperatures was observed across most of the Caribbean region (Fig 2). Across our COOP sites, the highest daily temperature was 100°F, observed at the Ponce 4 E station on July 16th, and the lowest temperature was 45°F at the Toro Negro station on January 21st. The highest temperatures across the main climate sites were 95°F on September 21st at the San Juan International Airport, 93°F on July 18th at the Saint Thomas International Airport, and 94°F on July 24th at the Saint Croix International Airport. The lowest temperatures observed across the main climate sites were 69°F on January 26th at the San Juan International Airport, 70°F on January 15th at the Saint Thomas International Airport, and 68°F at the Saint Croix International Airport, although Saint Croix observed 68°F several times this year.

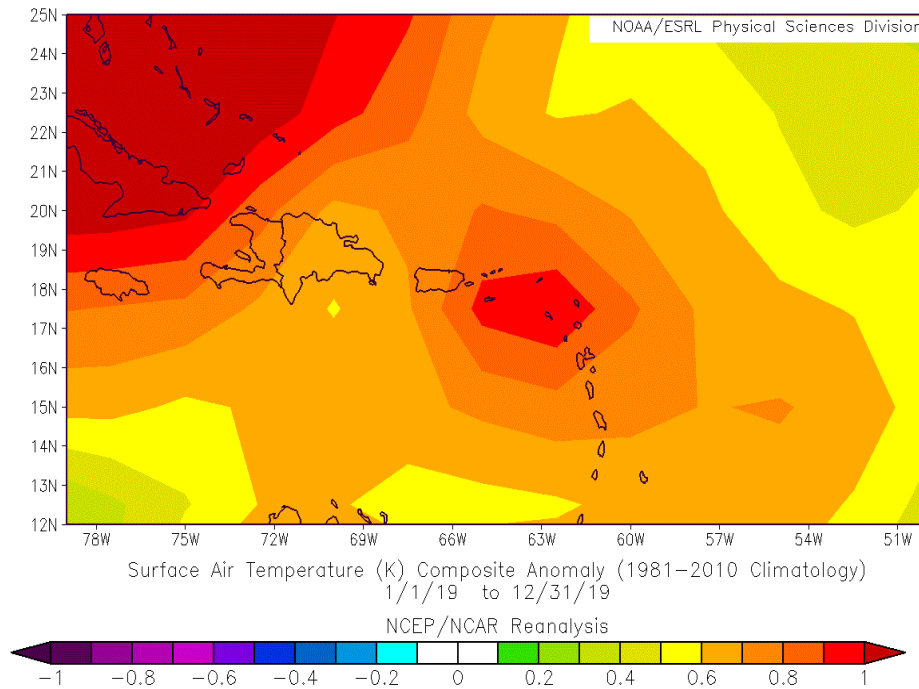


Figure 2. Surface Air Temperature Anomaly for the Caribbean from Jan 1st 2019 through Dec 31st 2019.

At the main climate data sites, 83, 94, 63 percent of the normal rainfall was observed at Luis Muñoz Marin Airport (**JSJ**) in San Juan, Cyril E. King Airport (**IST**) in Saint Thomas, and Henry E Rohlsen Airport (**ISX**) in Saint Croix, respectively. A preliminary rainfall total of 46.79 inches was measured at TJSJ, which is 9.42 inches below normal; Saint Thomas observed 37 inches of rain, which is 2.21 inches below normal; and Saint Croix observed 24.36 inches of rain, which is 11.78 inches below normal, this is not counting the months of January and February which had too much missing rainfall data for it to be reliable at the Saint Croix Airport. In terms of temperature, the mean annual temperature at TJSJ was 81.8°F, which is approximately 0.8°F warmer than the 30-year normal from the National Centers for Environmental Information (NCEI). Saint Thomas and Saint Croix observed mean annual temperatures of 82.0°F and 81.4°F respectively, which indicates that both Saint Thomas and Saint Croix observed mean annual temperatures of 0.4°F above normal at their respective airport.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Observed	2.66	2.33	3.58	4.02	5.94	3.20	6.50	6.36	8.56	7.35	4.35	2.84
Normal	3.33	2.60	2.86	4.68	6.98	4.53	5.01	6.01	7.81	7.94	6.69	4.06
% PON per month	80	90	125	86	85	71	130	106	110	93	65	70
Accumulated	2.66	4.99	8.57	12.59	18.53	21.73	28.23	34.59	43.15	50.50	54.85	57.69
Normal accumulation	3.33	5.93	8.79	13.47	20.45	24.98	29.99	36.00	43.81	51.75	58.44	62.50
% PON accumulated	80	84	97	93	91	87	94	96	98	98	94	92

Table 1. 2019 Rainfall Totals and Percent of Normal (PON) across Puerto Rico based on COOP

Looking Ahead

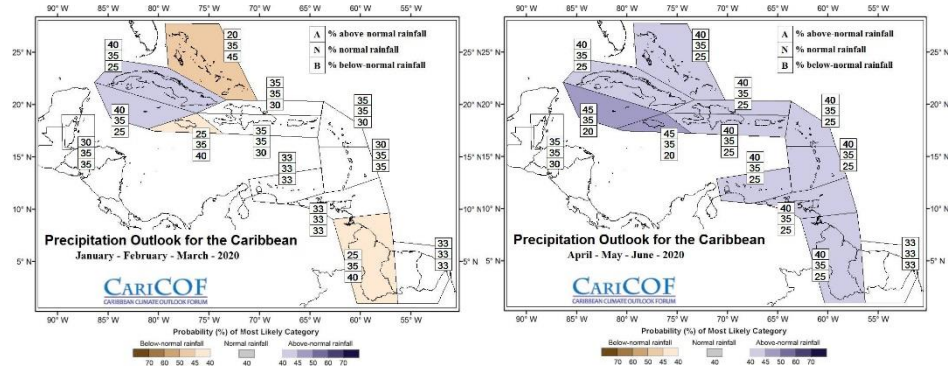


Image 1. CariCOF precipitation forecast for Jan-Feb-Mar and Apr-May-Jun

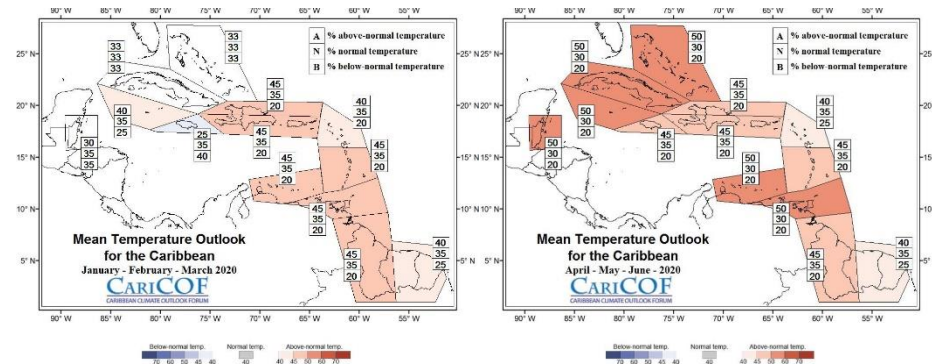


Image 2. CariCOF mean temperature forecast for Jan-Feb-Mar and Apr-May-Jun

Near average Sea Surface Temperatures (SSTs) were recently observed across the El Niño region of the Pacific, exhibiting ENSO-neutral conditions (neither El Niño nor La Niña anomalies). Most models suggest temperature anomalies to remain ENSO-neutral through the spring and summer of 2020. When there are ENSO-neutral conditions, there is no significant impact or contribution to the forecast, but it does add uncertainty. Slightly higher than average SSTs across the Caribbean is what is driving the higher than average temperatures and the “Equal Chances” for precipitation across the local islands, particularly when the SSTs across the Caribbean are expected to be near normal in the early part of the year. SSTs across the Caribbean are expected to increase once again to above normal in the Spring, which would increase the chances for above normal temperatures and the chances for wetter from April to June 2020. This is because warm SSTs in the Caribbean typically leads to above-average temperature and humidity, as well as enhanced atmospheric instability.

More Info: <http://rcc.cimh.edu.bb/long-range-forecasts/caricof-climate-outlooks/>

Highlights for Primary Climatological Data Sites

1. There were a total of 45 days (nights) with a minimum temperature of 80°F or above at the **Luis Muñoz Marín Airport** in 2019. This ranks as the 3rd highest number of “80°F or above” minimum temperature days on record.

Rank	Year	Number of days
1st	2009	59
2nd	2017	54
3rd	2019	45

2. There were a total of 92 days (nights) with a minimum temperature of 80°F or above at the **Cyril E. King** airport in **Saint Thomas**. This ranks as the 4th highest number of “80°F or above” minimum temperature days on record.

Rank	Year	Number of days
1st	2016	116
2nd	2010	106
3rd	2015	94
4th	2019	92

3. Longest streak of consecutive days without rain at the **Henry E Rohlsen Airport** in **Saint Croix**.

Rank	Year	Number of Consecutive Days Without Rain
1 st	March 11 th 2019 – April 11 th 2019	32
2 nd	April 1 st 1988 - May 1 st 1988	31
3 rd	February 24 th 1958 - March 21 st 1958	26
4 th	May 24 th 2012 – June 15 th 2012	23
5 th	May 9 th 2008 – May 31 st 2008	23
6 th	June 3 rd 2001 – June 23 rd 2001	21
7 th	March 21 st 1980 – April 10 th 1980	21
8 th	March 28 th 1973 – April 17 th 1973	21
9 th	January 14 th 1980 – February 2 nd 1980	20
10 th	March 2 nd 2018 – March 20 th 2018	19

2019 Monthly & Seasonal Highlights for Primary Climatological Data Sites

	Dec (2018)	Jan	Feb	Season
JSJ	5 th driest 2.25”	---	---	7 th driest 6.52”
IST	9 th driest 1.46”	---	---	---
ISX	8 th warmest 80.1°F	---	2 nd warmest 80.0°F	5 th warmest 79.5°F

Table 2. Winter 2018-19

	Mar	Apr	May	Season
JSJ	10 th warmest 79.5°F	10 th warmest 80.7°F	8 th driest 1.97”	10 th warmest 80.7°F 8 th driest 6.05”
IST	---	9 th driest 1.03”	---	---
ISX	1 st driest 0.02”	7 th driest 0.49”	10 th wettest 6.28”	---

Table 3. Spring 2019

	Jun	Jul	Aug	Season
JSJ	---	8 th warmest 84.0°F	3 rd warmest 84.5°F	7 th warmest 84.0°F
IST	10 th warmest 84.1°F 9 th driest 0.58"	8 th warmest 84.5°F 1 st wettest 7.75"	10 th wettest 6.24"	10 th warmest 84.3°F 6 th wettest 14.57"
ISX	5 th driest 0.49"	---	---	---

Table 4. Summer 2019

	Sep	Oct	Nov	Season
JSJ	1 st warmest 84.9°F 10 th wettest 9.54"	10 th warmest 83.6°F	2 nd warmest 82.2°F	3 rd warmest 83.6°F
IST	8 th warmest 84.6°F	4 th warmest 84.1°F	4 th warmest 82.3°F	5 th warmest 83.7°F 6 th driest 9.27"
ISX	---	8 th warmest 83.1°F 3 rd driest 1.12"	10 th warmest 81.5°F 7 th driest 2.27"	8 th warmest 82.6°F 1 st driest 6.11"

Table 5. Fall 2019

	Dec (2019)	2019
JSJ	1 st warmest 81.5°F	6 th warmest 81.8°F
IST	7 th wettest 4.93" 3 rd warmest 81.2°F	4 th warmest 82.0°F
ISX	2 nd warmest 81.2°F	7 th warmest 81.4°F

Table 6. December 2019 and Total 2019 Highlights

Additional Highlights Based on COOP Data

Wettest Days

Station	Rainfall	Date
San Lorenzo 3 S	7.10"	4/29/2019
Río Blanco Lower	7.04"	7/31/2019
Hacienda Constanza 2 W	4.60"	8/08/2019
Paraíso	4.50"	7/28/2019
East Hill	4.44"	5/02/2019

Hottest Days

Station	Temperature (°F)	Date
Ponce 4 E	100	7/16/2019
Aguirre	98	8/19/2019
Lajas Substation	97	9/17/2019
Isabela Substation	97	6/21/2019
Dos Bocas	97	7/16/2019

Coollest Nights

Station	Temperature (°F)	Date
Toro Negro Forest	45	1/21/2019
Adjuntas Substation	50	1/26/2019
Maricao 2 SSW	57	3/05/2019
Aibonito 1 S	58	3/24/2019
Ciales 2 S	59	2/04/2019

Data are preliminary and have not undergone final quality control by the National Centers for Environmental Information / NCEI/. Therefore, these data are subject to revision.

Maps with radar estimated rainfall and rainfall deficits.

